

Design application learning physics on material newton's law-based virtual lab

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Abstract

Currently the world is experiencing an outbreak of the COVID 19 virus disease, so many people have become victims, so all activities are limited. This happens in the field of education, the learning atmosphere that usually takes place face-to-face has now changed to using online media from elementary to university level. PHYSICS learning in SMA is not only focused on concept theory but to support student centered learning, learning prioritizes the process of discovering and researching these materials and concepts themselves. Thus the existence of a laboratory becomes important where the purpose of holding learning in the laboratory is to develop student skills such as the use of tools, observation, train students carefully and recognize the limits of laboratory measurement abilities, train accuracy in recording, reporting, Results, stimulating critical thinking in experimental analysis, through the interpretation of experiments, deepen knowledge and develop responsibility and honesty as well as train students to plan and conduct experiments. But in reality, with the pandemic, students have difficulty in practical learning in the laboratory. Through the application of learning physics on Newton's law material based on the Virtual Lab, students can interactively interact with the application by choosing virtual practicum tools and materials. This application can be a tool for understanding learning so that it can increase student grades, especially during a pandemic.

Keywords: Practicum; Virtual-Lab; Physics; Newton's Laws

1. Introduction

All parts of the world are currently experiencing the spread of the COVID-19 virus outbreak. Likewise what happened in Indonesia, so many newspapers fell due to this virus. In the NTT region, precisely in the Sikka district, this cannot be separated from the large number of COVID cases. There are 21 sub-districts in the Sikka district that have data on confirmed recovered and died COVID cases. In the sub-district areas affected by COVID-19 in Sikka Regency, there are 2 sub-districts that have the highest impact of COVID, namely Alok and Alok Timur [1].

Schools during the pandemic implemented an online learning system, but schools faced many obstacles. One of them is in the Physics practicum material, school students are required to study in the laboratory room, but in reality learning in this laboratory is difficult due to the co-19 pandemic. Students are only given learning files sent by the teacher in the form of power point files or PDFs. Students experience difficulties in learning, this happens because practicum learning requires practice/testing directly using practicum tools and materials. While students are required to study at home, if there is a shift pattern, the problem is that students have limited learning time. all of these problems are feared to make a decrease in student scores.

Physics is a science that has many equations and calculations [2]. To help students build their competence, physics education places great emphasis on hands-on practice. Learning is focused on discovering and doing to provide students with a richer understanding of the natural world. If learning is carried out through practical activities, then the process

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of providing direct experience as well as the process of learning and doing what is meant here is very effective in its implementation [3].

Virtual Reality (VR) is an artificial setting that uses visual and aural stimulation to give users the impression that they are in a real setting [4]. For skills transfer processes such as practicum, this technology offers a sense that is close to reality. This technology can sometimes even create memories that make it appear as if the user actually did something [5]. One of the systems that can be used to assist traditional practicum systems is a virtual laboratory. This virtual lab is often referred to as V-Lab or Virtual Laboratory. It has been shown that using virtual labs helps students understand concepts better [6]. Separation practicum, a field of science in analytical chemistry, is one of the activities that might greatly benefit from the development of a virtual laboratory. It is very important to have knowledge of how to use practical tools and materials correctly based on the properties of chemical separation materials. Therefore, the purpose of this research is to create virtual laboratory teaching materials for android integrated chemical separation practicum, with the following objectives:

- To describe the validity and readability tests of virtual laboratory teaching materials in android integrated chemical separation practicum; and
- Making virtual laboratory teaching materials.

The creation of virtual lab learning resources is expected to increase students' competency achievement in learning chemistry in affective, cognitive, and psychomotor understanding and to arouse their interest in these subjects [7]. Based on research on the use of virtual laboratories in practical learning, it can be seen that the use of virtual laboratories can increase scientific attitudes and provide solutions to shortages of equipment and materials in practicum activities, thus enabling the creation of virtual laboratories that focus on material [8].

The purpose of this research is to create a Virtual Lab application, which will be installed on students' smartphone devices. The purpose of this research is that through this application students can learn Physics practicum material virtually, students can understand the practicum material, so that it can help increase student scores during a pandemic.

2. Material and methods

2.1. Practicum

Practicum is an exercise that tries to better prepare students to understand theory and practice. Students can learn many things through direct experience, including:

- Skills can be developed through practical tasks,
- Provide opportunities for students to practice their knowledge and skills, and
- Understand knowledge and inquiry abilities, conduct scientific research, and
- Prove something scientifically.

Therefore, researchers use real-world approaches to teach science using single and mixed chemicals in the hope that students will have a deeper understanding of these concepts [9]. The importance of science practicum activities can be attributed to four factors. One of the four explanations is 1) Practicum increases the desire to learn science, develops the basics of experimentation, serves as a vehicle for learning scientific methodology, and supports subject content. The practicum approach allows learning to be focused on real processes and debated with peers in order to obtain the latest ideas, ideas or concepts. The goal of the practicum method is for students to be able to prove the truth of the applicable conceptual theory and for students to feel satisfied with their learning [9].

2.2. IPA Physics

IPA (Natural Science) is one of the subjects to improve rational thinking. IPA is essentially built on the basis of scientific processes, scientific products, and scientific attitude. IPA Science gives students the ability to acquire organized knowledge, concepts and ideas about nature by using various scientific methods [10].

Physics is one of the basic sciences that makes a significant contribution to the progress of science and technology. In physics subjects it can help students gain knowledge, skills, and confidence by teaching them how to solve problems both qualitatively and quantitatively by utilizing mathematics and drawing conclusions from various natural events [1].

2.2.1. Newton's Laws of Motion

Newton's laws establish the relationship between the acceleration of an object and its mass and external forces. There are three Newton's laws regarding motion, including Newton's First Law, Newton's Second Law, and Newton's Third Law.

According to Newton's second law, an object can be moved by a single force or a combination of forces whose sum is not zero. An object accelerates because its speed is always changing. Consequently, the resultant force and the consequent acceleration are related. This connection was investigated by Newton, so that Newton succeeded in coining his second law of motion, known as Newton's second law. The sound of Newton's Second Law is: The acceleration produced by the resultant force acting on an object is directly proportional to the resultant force, in the direction of the resultant force, and inversely proportional to the object's mass.

Tools and materials include:

- Sheet of paper
- Mistar E.
- 3 loads
- Drinking water bottles
- 2 spring balances
- 30 cm long rope

2.3. Virtual Labs

The virtual laboratory is a system that can be applied to complement the traditional practicum system. Usually, this virtual lab is referred to as V-Lab, or Virtual Laboratory. It is believed that the establishment of this virtual laboratory will give students the opportunity to complete practicums regardless of whether they have an internet connection or not, so that students can do so without having to be physically present in the lab. Because students may actively learn on their own without the help of a teacher or helper like a running system, then method learning This become effective [3].

2.3.1. Design

The next stage is design, at this stage, the author begins to create a model using the findings from the analysis. How the application accomplishes what it needs to complete is determined by design. Application modeling is done at this point. The purpose of this model is to better understand the operational behavior and information included in the control data flow of functional processes. Several things are involved in this process, namely:

- Flow Chart Application diagram that contains elements of entity sets and relationship sets, each of which has attributes.
- Panel design, which describes the layout and purpose of each menu screen.

3. Results and discussion

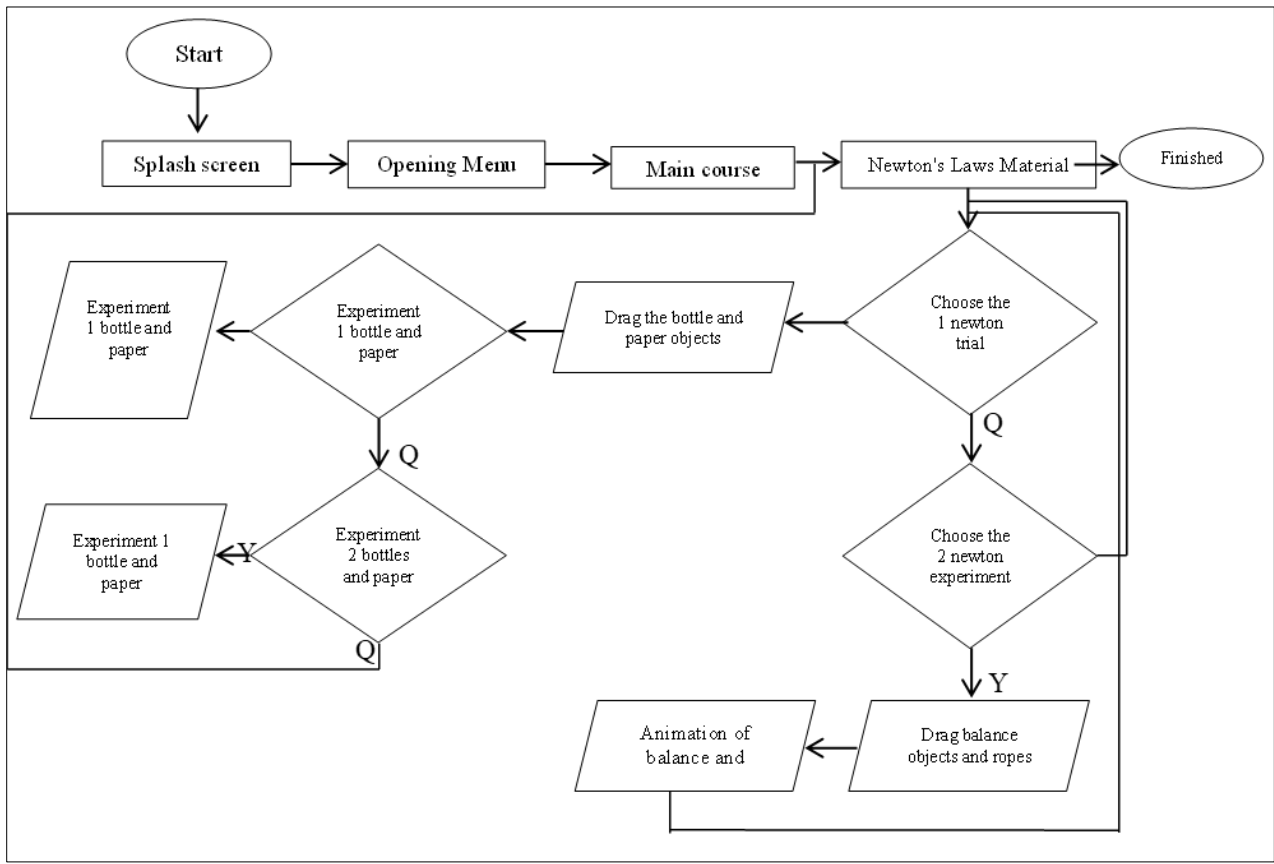


Figure 1 V-Lab Physics Application Flowchart

3.1. Design Application

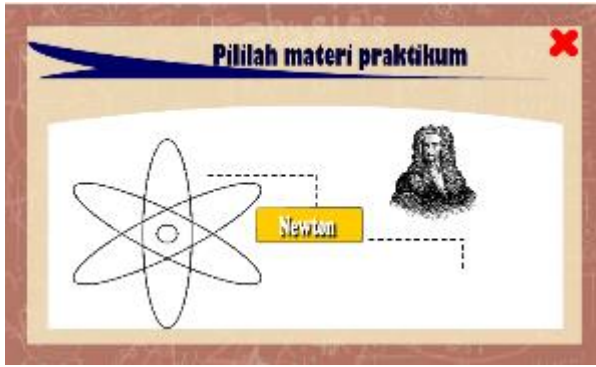
Stage This is stage planning screen Physics V-Lab application Material Newton's laws



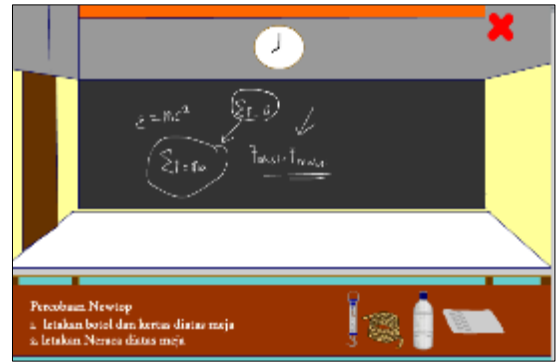
Splash screens



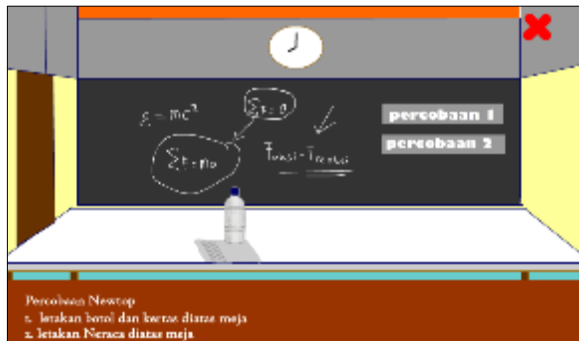
Welcome page



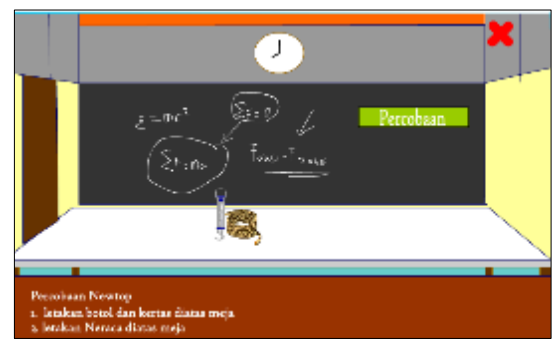
Material Menu page



Newton Material Page



The Bottle and Paper Experiment



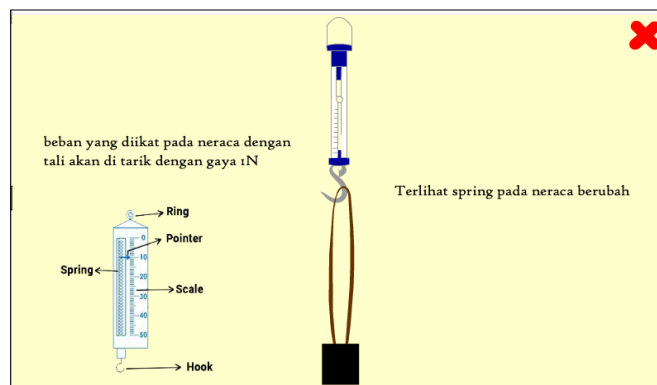
Trial Balance and Table



First Test Page



Second Test Page



Third Test Page

Figure 2 The appearance of the V-Lab Application of Material Physics Newton's Laws

4. Conclusion

This is the explanation of making the V-Lab Physics application on Newton's Laws. From the analysis and discussion that has been carried out, conclusions can be drawn, namely: the design of this application is believed to be able to be a tool for understanding learning so that it can increase student scores, especially during a pandemic like today.

Suggestion

With the design of this physics v-lab application that is currently running or a system that is being developed, it is recommended:

- Develop addition material physics on application this.
- Develop 3 dimensional animation on application.

Compliance with ethical standards

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Disclosure of conflict of interest

The author hereby declares that the published data in the manuscript have no conflict of interest against any parties. If at a later date, this is found, the full responsibility for this matter lies with the author.

References

- [1] F. A. Wara, C. Hildegardis, and I. D. Reja, "Grouping People in Sikka Regency Areas Affected by COVID Using the K-Means Algorithm," in SEMNASTEKMU 2021, 2021, pp. 316–323.
- [2] I. Y. Okyranida, F. Widiyatun, and D. A. S. Asih, "Physics Calculator Application Design on Newtonian Force Material," Journal of Research Innovation, vol. 1, no. 8, pp. 1663–1668, 2021.
- [3] H. Jaya, "Development of a virtual laboratory for practicum activities and facilitating character education in SMK," Journal of Vocational Education, vol. 2, no. 1, pp. 81–90, 2013, doi: 10.21831/jpv.v2i1.1019.
- [4] P. D. Petrov and T. V. Atanasova, "The Effect of augmented reality on students' learning performance in stem education," Inf., vol. 11, no. 4, 2020, doi: 10.3390/INFO11040209.
- [5] S. Y. Oh and J. Bailenson, "Virtual and Augmented Reality; The International Encyclopaedia of Media Effects," pp. 1–16, 2017.
- [6] T. Darby-White, S. Wicker, and M. Diack, "Evaluating the effectiveness of virtual chemistry laboratory (VCL) in enhancing conceptual understanding: Using VCL as pre-laboratory assignment," Journal Comput. Math. Sci. Teach., vol. 38, no. 1, pp. 31–48, 2019.
- [7] D. Rokhim, M. Asrori, and H. Widarti, "Development of Virtual Laboratory on Smartphone Integrated Chemical Separation Practicum," Journal of Educational Technology Studies., vol. 3, no. 2, pp. 216–226, 2020, doi: 10.17977/um038v3i22020p216.
- [8] Z. Arifin, E. Destiansari, and S. Amizera, "Development of Mobile Virtual Laboratory in Practicum Learning on Water Pollution," Bioedusiana: Journal of Biology Education., vol. 5, no. 2, pp. 123–130, 2020, doi: 10.37058/bioed.v5i2.2216.
- [9] Trianto, The Integrated Learning Model: Strategic Concepts, and Their Implementation in the Education Unit Level Curriculum (KTSP). Jakarta: Bumi Aksara, 2014.
- [10] R. Susanti, "The Effect of Applying Problem-Based Learning to Photosynthesis and Respiration Practicum to Improve Generic Science Abilities of Biology Education Students, FKIP Unsri," Proceeding Biol. Educ. Conf., vol. 14, no. 1, pp. 62–68, 2017.